

BALL GRID ARRAY PACKAGE SUBSTRATES AND METHOD OF  
MAKING THE SAME

ABSTRACT OF THE DISCLOSURE

An electrically and mechanically enhanced die-down tape substrate ball grid array (BGA) package substrate is described. An IC package includes a substrate that has a first surface. The first surface has a central opening. A stiffener/heat spreader has a first surface. The first surface of the stiffener has a central ground ring. The first surface of the stiffener is coupled to a second surface of the substrate. The central opening has an edge. The edge includes at least one of the following: (a) a protruding edge portion that extends across at least a portion of the central ground ring, (b) a recessed edge portion that exposes a portion of the central ground ring, or (c) a hole proximate to the edge, wherein the hole exposes a portion of the central ground ring.

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